

Difficult Run and Accotink Creek Bacteria and Benthic TMDLs Development

TAC Meeting #1

July 17, 2007



Objective:

- **To present and review the steps and the data used in the development of bacteria and benthic TMDLs for listed segments in the Difficult Run and Accotink Creek Watersheds.**

Bacteria TMDL: Difficult Run

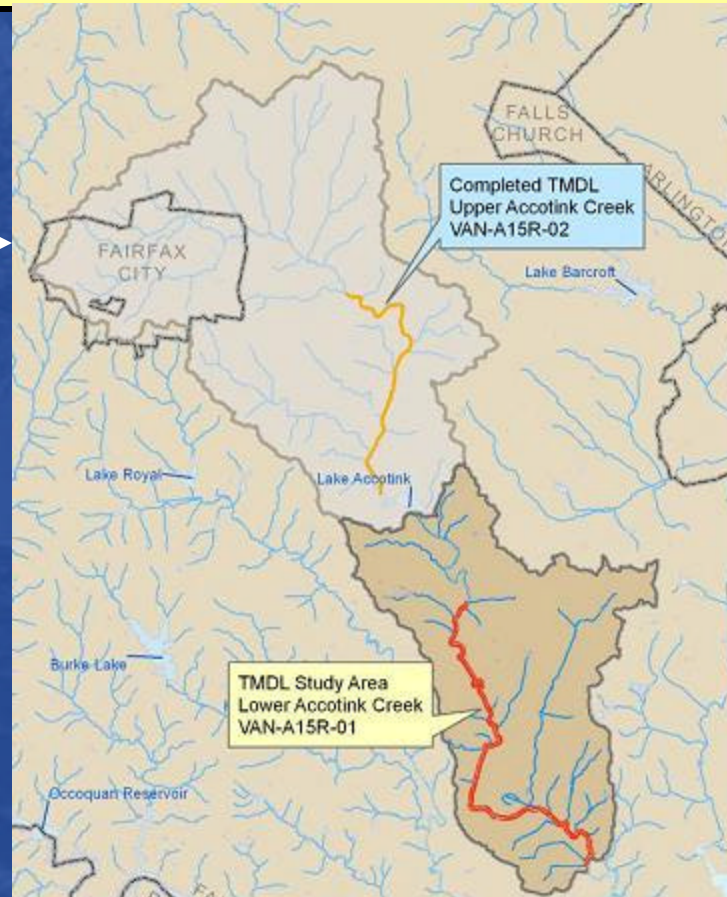


| TMDL ID | Stream Name | Length (miles) | Boundaries | Listing Station ID: | Impairment for | Exceedence Rate* |
|-------------|---------------|----------------|---|---------------------|---------------------------------------|------------------|
| VAN-A11R-01 | Difficult Run | 2.93 | Confluence of Captain Hickory Run downstream to the confluence with the Potomac River | 1ADIF000.86 | Total Fecal Coliform (listed in 2004) | 19/85 (22%) |
| | | | | | E. Coli (Listed in 2004) | 5/21 (24%) |

* Based on DEQ water quality data collected between 1995 and 2006

Bacteria TMDL: Accotink Creek

Upper Accotink Creek:
TMDL Approved by DEQ
and EPA (2003)

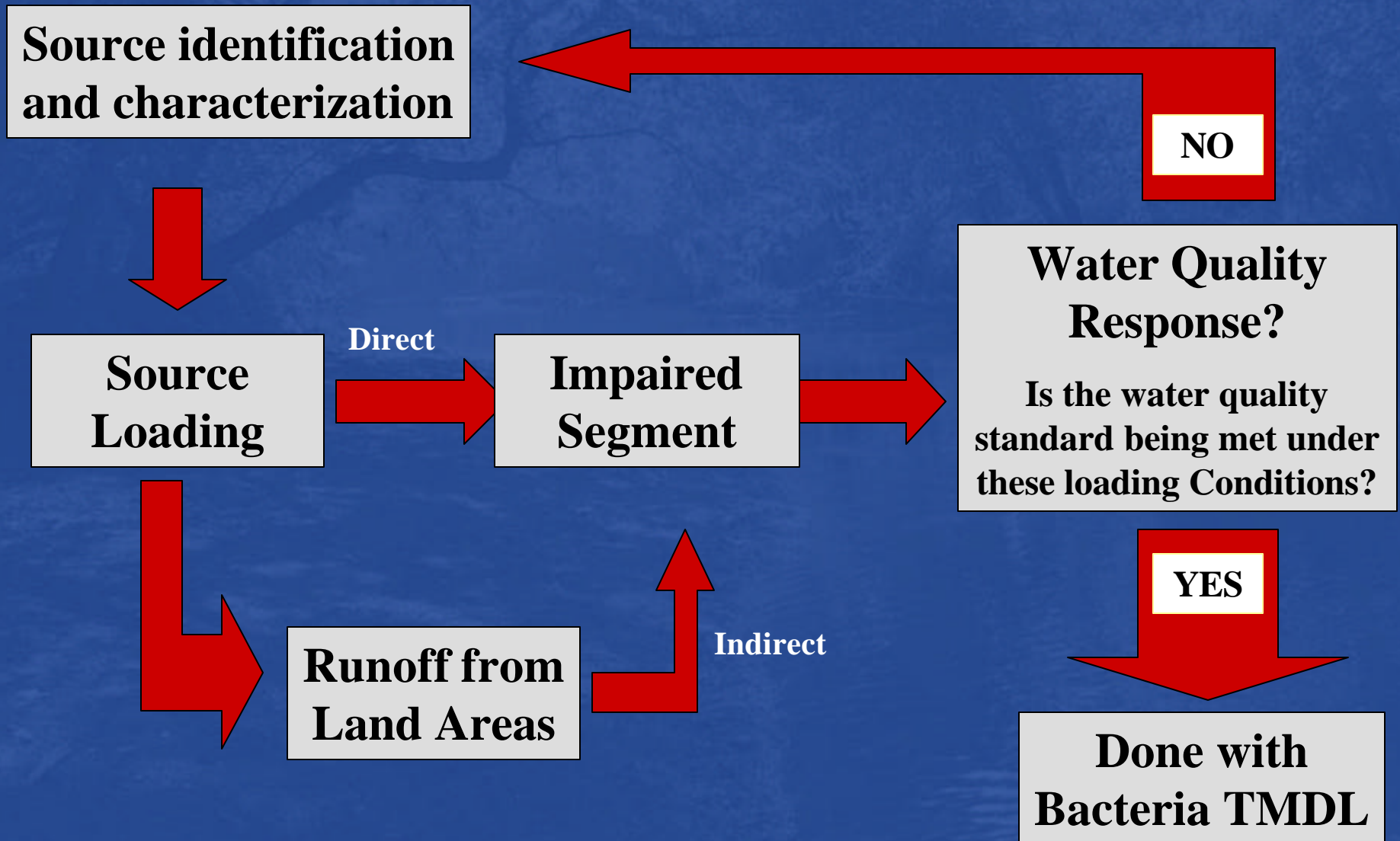


Lower Accotink Creek:
Current TMDL Study
Watershed

| TMDL ID | Stream Name | Length (mi) | Boundaries | Station ID: | Impairment for | Exceedence Rate* |
|-------------|----------------|-------------|---|-------------|-----------------------|------------------|
| VAN-A15R-01 | Accotink Creek | 7.35 | Confluence of Calamo Branch to end of free-flowing waters (Rt. 1) | 1AACC006.10 | Fecal Coliform (2004) | 11/66 (17%) |

* Based on DEQ water quality data collected between 1995 and 2006

Bacteria TMDL Development Process



Water Quality Model: HSPF

Hydrologic Simulation Program Fortran

Input



Model



Output

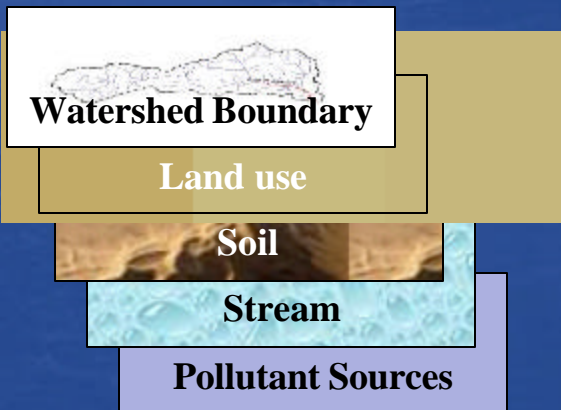
Factors:

Rainfall events

Fecal coliform build up

Fecal coliform wash off

Fecal coliform die off rates



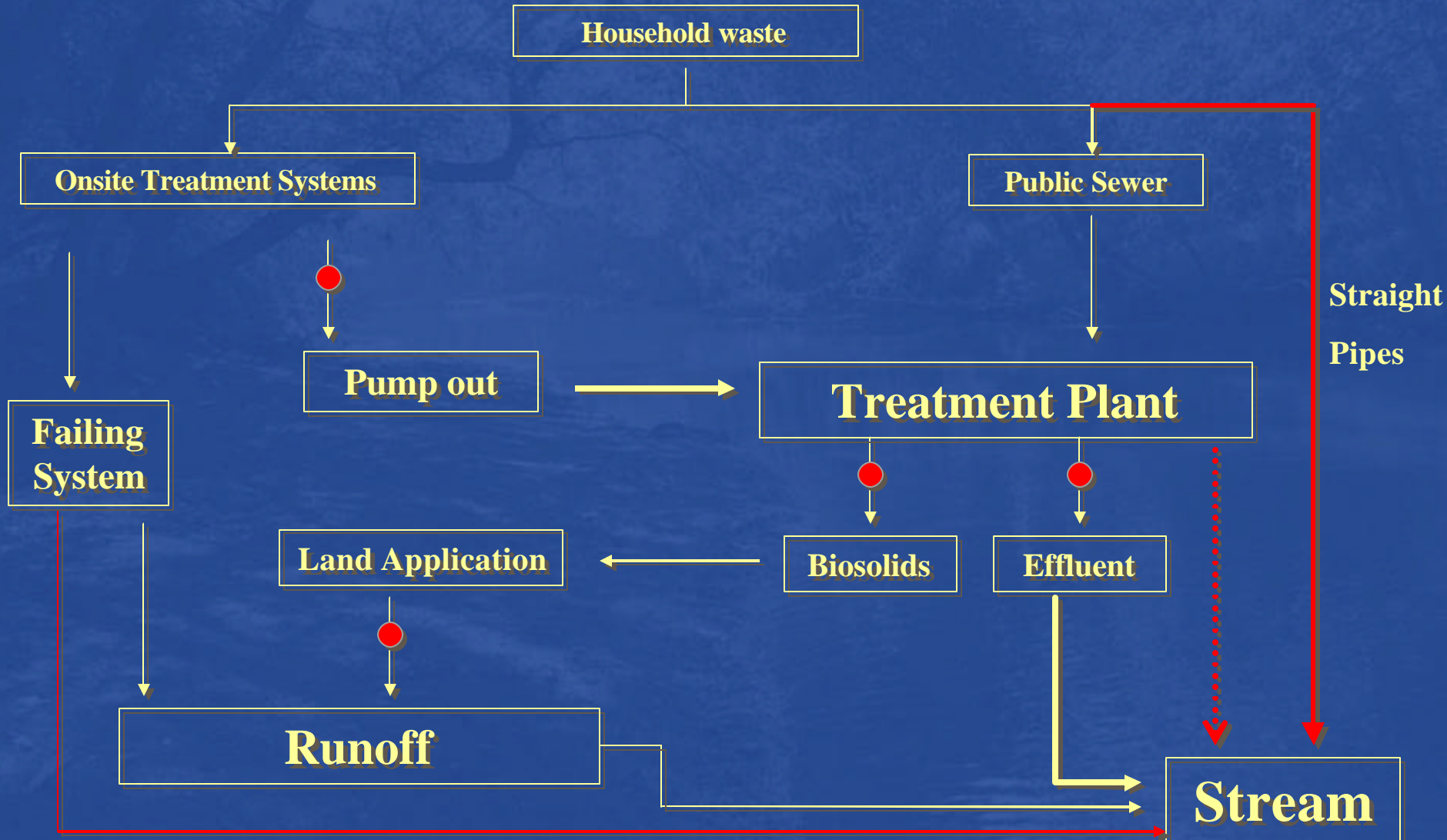
Bacteria Sources Assessment

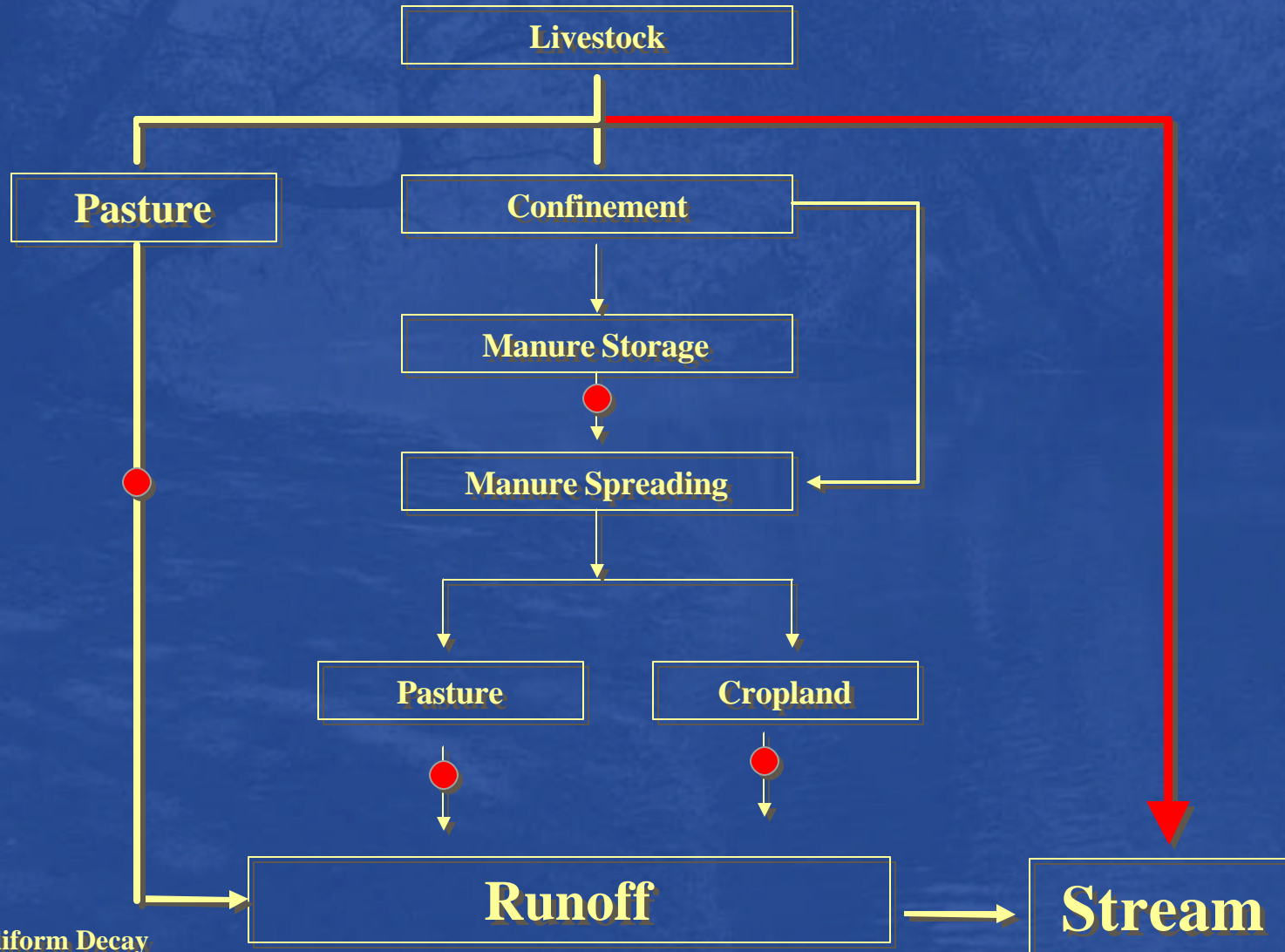
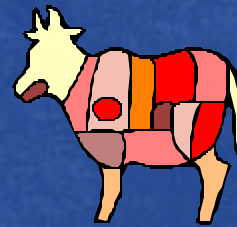
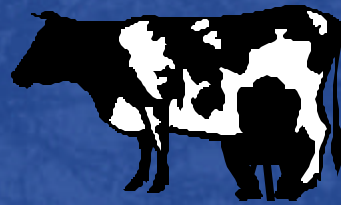
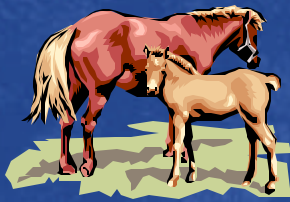
Addresses the following issues related to **bacteria** production:

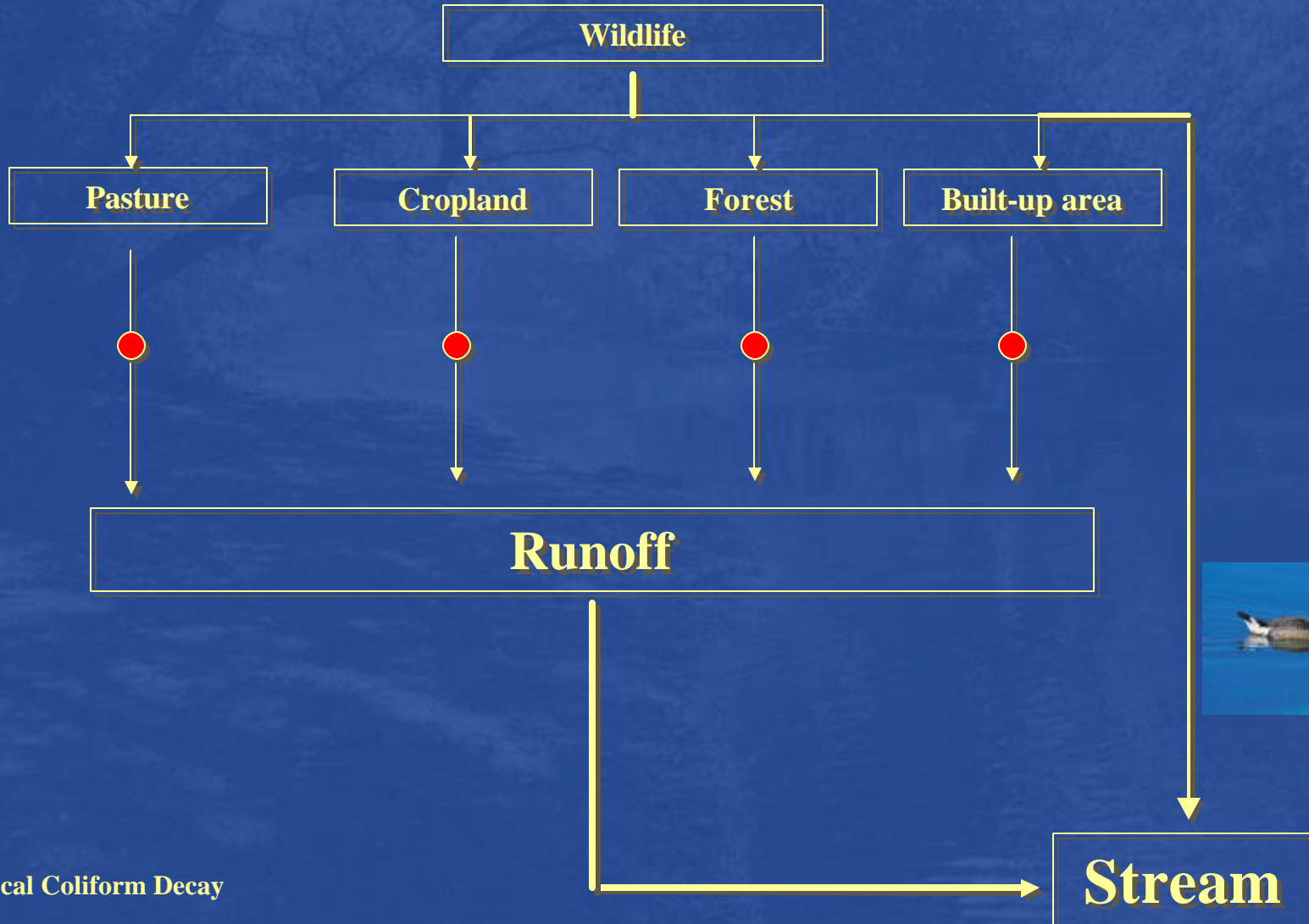
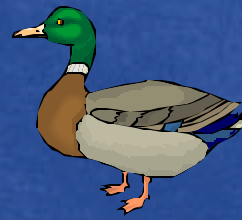
- **Bacteria loading from Human Sources**
 - Straight pipes
 - Septic systems
 - Biosolids
- **Bacteria loading from Livestock**
 - Livestock inventory
 - Livestock grazing and stream access
 - Confined animal facilities
 - Manure management
- **Bacteria loading from Wildlife**
 - Wildlife Inventories
- **Bacteria loading from Pets**
 - Pet Inventories
- **Best management practices (BMPs)**

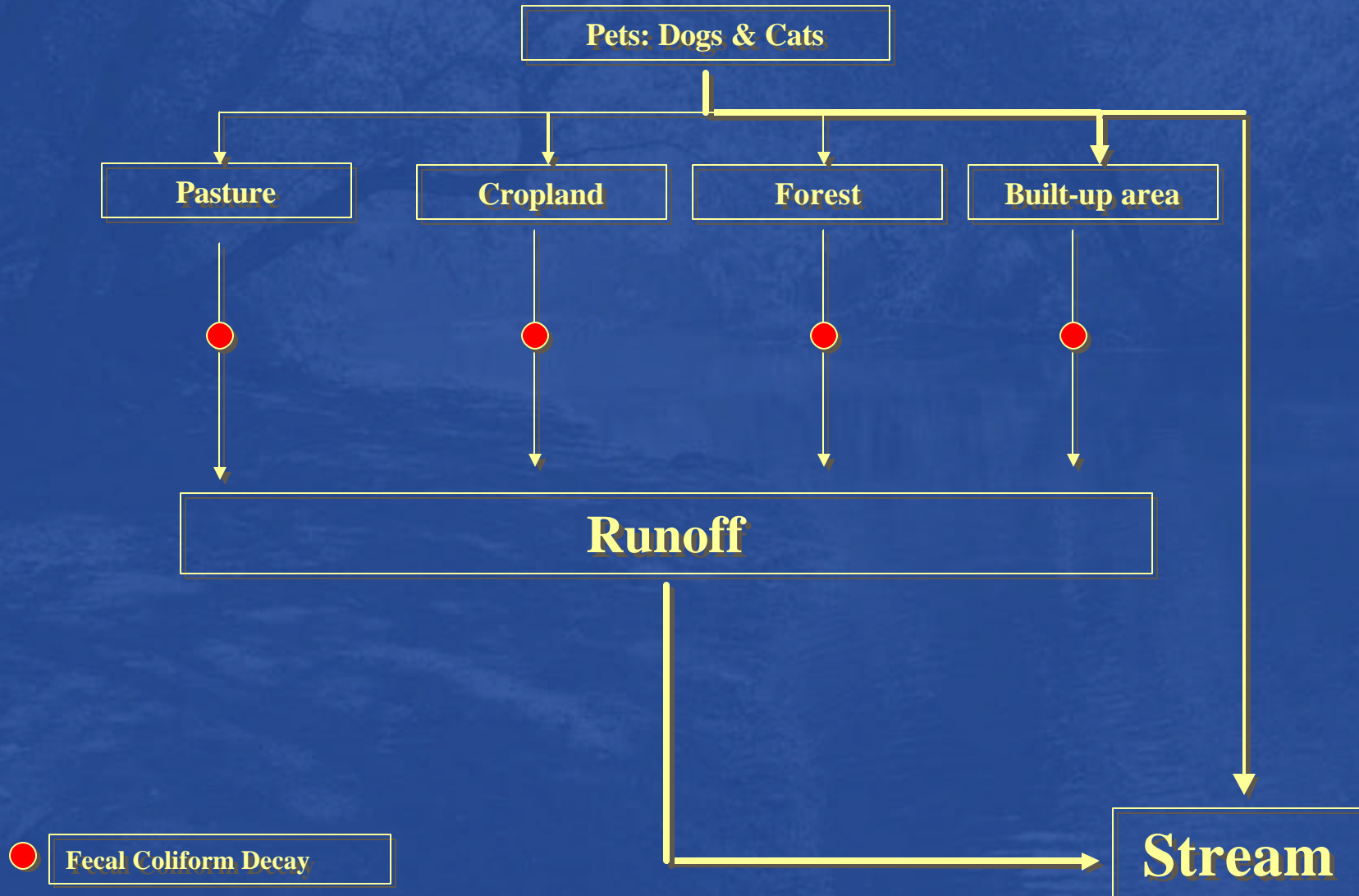
Human Contribution

Fecal Coliform Decay









Source Loading Estimates

- **Determine the daily fecal coliform production by source**
- **Estimate the size/number of each source**
- **Determine whether the source is**
 - Direct Source
 - Indirect Source
- **Calculate the load to each land use based on a monthly schedule and for each source**
- **The sum of all the individual sources is the total load**
- **Source loading estimates used in HSPF model to simulate in-stream bacteria concentrations**

Data Needs

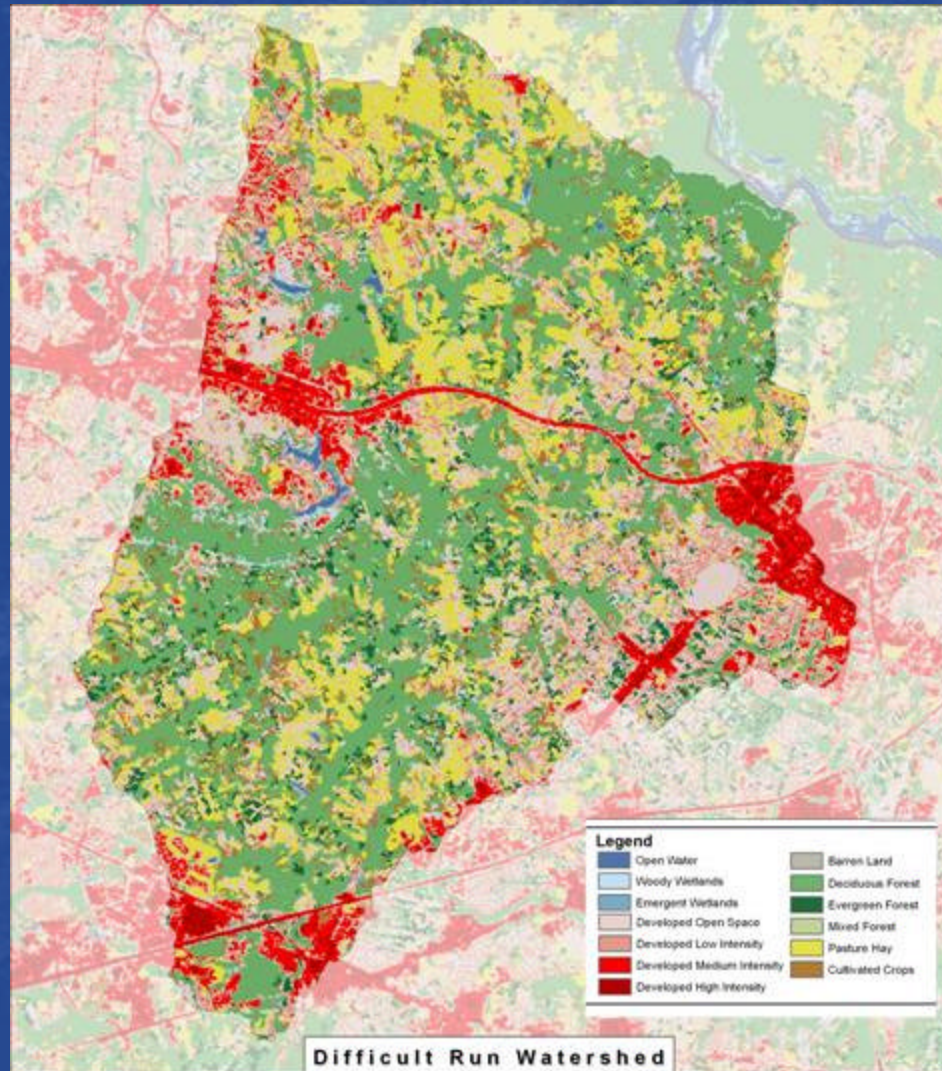
Data and Information Needs:

- **Watershed physiographic data**
- **Hydrographic data**
- **Weather data**
- **Permitted point sources and direct discharges**
 - Permit data and information
 - Discharge monitoring reports (DMR)
- **MS4 permits and information**
- **Environmental monitoring data**
- **Stream flow data**
- **Bacteria sources assessment data**

Watershed physiographic data:

| Type of Information | Data Source | Obtained | Processed/ Analyzed | Notes |
|-------------------------------------|--|----------|------------------------|------------------------------------|
| Stream network | <i>Reach File Version 3 (US EPA BASINS) National Hydrography Data (USGS)</i> | Yes | Yes | |
| Land Use/ Land Cover data | <i>National Land Cover Data (NLCD) 2001</i> | Yes | Yes | |
| Soils | <i>USDA State Soil Geographic Database (STATSGO)</i> | Yes | Yes | |
| Digital Elevation Model (DEM) | <i>BASINS</i> | Yes | Yes | 10-meter DEM resolution |

Difficult Run Watershed Land Use



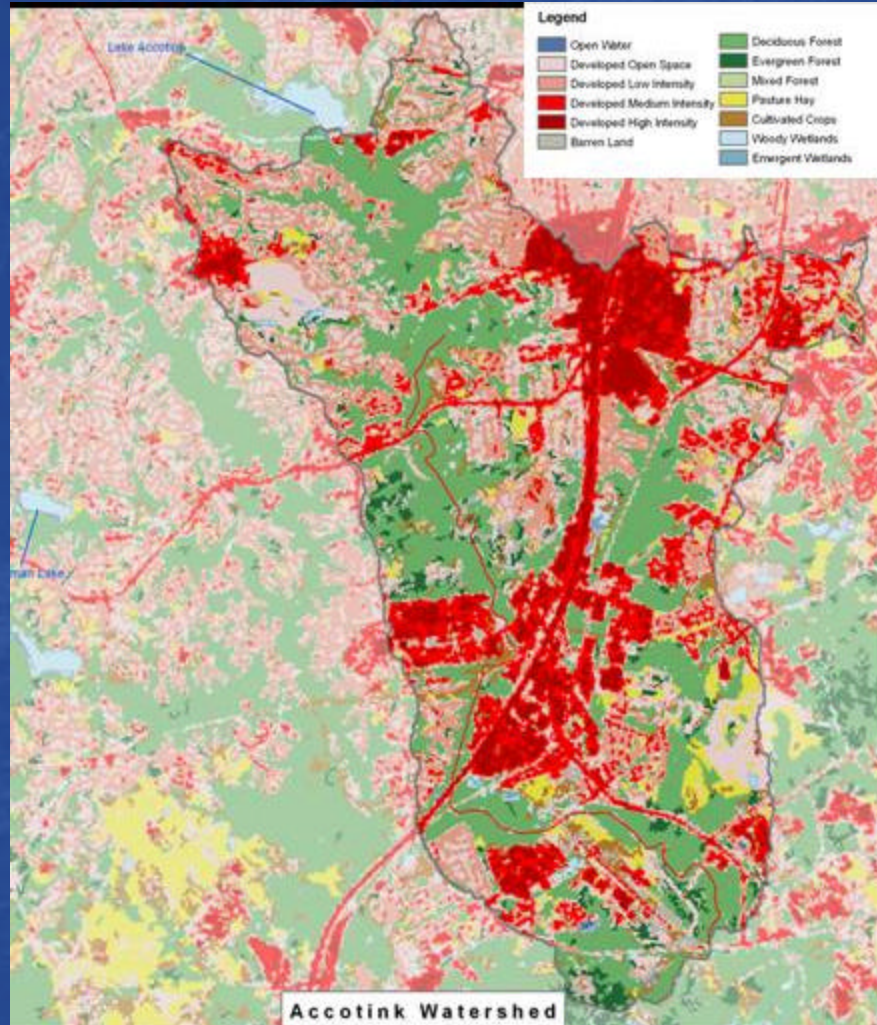
Dominant Land Use Types:

Forest: 37%

Agricultural: 25%

Urban: 18%

Lower Accotink Creek Watershed Land Use



**Dominate Land Use
Types:**

Urban: 44%

Forest: 29%

Agriculture: 7%

Bacteria Sources Assessment data:

| Type of Information | Data Source | Obtained | Processed/ Analyzed |
|--|--|-------------|------------------------|
| Population/ Household/ Septic System Estimates | <i>U.S. Census Bureau</i> | Yes | Yes |
| Livestock estimates/ agricultural practices | <i>USDA National Agricultural Statistics Service Soil and Water Conservation Districts Virginia Department of Health</i> | In Progress | In Progress |
| Wildlife estimates | <i>Virginia Department of Game and Inland Fisheries</i> | Yes | In Progress |
| Pet Estimates | <i>U.S. Census Bureau National pet estimates per household</i> | Yes | In Progress |
| Active and historical industrial site locations | <i>Virginia Department of Environmental Quality Local agencies and stakeholders</i> | Yes | Yes |

Population Estimates and Sewage Disposal

Based on 2004 US Census Data

Difficult Run Watershed:

| Watershed | Total Population | Total Households | Houses on: | | | |
|----------------|------------------|------------------|---------------|--------------|----------------|-------------|
| | | | Sewer | Septic | Failed Septic* | Other means |
| Fairfax County | 123,430 | 48,155 | 44,967 | 3,087 | 50 | ~0 |
| Fairfax City | 849 | 320 | 316 | 4 | 0 | ~0 |
| Total | 124,279 | 48,476 | 45,284 | 3,091 | 50 | ~0 |

*Failure Rate: 1.62% from NVPDC, 1990

Accotink Creek Watershed:

| Watershed | Total Population | Total Households | Houses on: | | | |
|--------------------|------------------|------------------|---------------|--------------|----------------|-------------|
| | | | Sewer | Septic | Failed Septic* | Other means |
| Upper ¹ | 110,000 | 40,741 | 39,727 | 1,014 | 16 | ~0 |
| Lower ² | 51,624 | 16,237 | 15,162 | 1,041 | 17 | ~0 |
| Total | 161,624 | 56,978 | 54,889 | 2,055 | 33 | ~0 |

¹Estimates based on 2000 US Census Data (Accotink Creek TMDL, 2003)

²Estimates based on 2004 US Census Data

*Failure Rate: 1.62% from NVPDC, 1990

Livestock Estimates

Livestock numbers are based on the Fairfax County 2002 US Agricultural Census data and the horse numbers are based on the 2001 VA Agricultural Statistics Equine report.

| Difficult Run Watershed | |
|------------------------------|-------|
| Livestock Type | Total |
| Beef cows | 119 |
| Milk cows | 3 |
| Hogs and pigs inventory | 20 |
| Sheep and lambs inventory | 34 |
| Chickens | 133 |
| Horses and ponies, inventory | 795 |

| Lower Accotink Creek Watershed | |
|--------------------------------|-------|
| Livestock Type | Total |
| Beef cows | 6 |
| Milk cows | 0 |
| Hogs and pigs inventory | 1 |
| Sheep and lambs inventory | 2 |
| Chickens | 7 |
| Horses and ponies, inventory | 41 |

Wildlife Estimates

Estimates are based on NLCD 2001 land use data and distribution estimates from DGIF (Map Tech, Inc., 2001) and the distribution estimates from the Upper Accotink Creek Watershed TMDL (USGS, 2003)

Difficult Watershed:

| Wildlife Animal | Total |
|-----------------|-------|
| Deer* | 2,098 |
| Raccoon* | 6,637 |
| Muskrat* | 2,981 |
| Beaver | 534 |
| Goose-Summer* | 3,010 |
| Goose Winter* | 3,215 |
| Duck Summer* | 578 |
| Duck Winter* | 838 |
| Wild Turkey | 373 |

Accotink Creek Watershed:

| Wildlife Animal | Upper | Lower | Total |
|-----------------|-------|-------|-------|
| Deer* | 919 | 571 | 1,490 |
| Raccoon* | 4,374 | 2,399 | 6,773 |
| Muskrat* | 181 | 457 | 638 |
| Beaver | - | 174 | 174 |
| Goose Summer* | 3,968 | 3,446 | 7,414 |
| Goose Winter* | 4,028 | 4,730 | 8,758 |
| Duck Summer* | 484 | 213 | 697 |
| Duck Winter* | 743 | 667 | 1,410 |
| Wild Turkey | - | 114 | 114 |

* Estimates based on Upper Accotink TMDL distributions, all others are based on DGIF estimates

Pet Estimates

Pet inventories based on:

- 1 dog per 8 people*
- 2 cats per 3 people *

*Upper Accotink Creek TMDL (2003)

In the Difficult Run Watershed there are approximately:

- 15,535 Dogs
- 82,852 Cats

- In the Accotink Creek Watershed there are approximately:

| Watershed | Dogs | Cats |
|--------------|---------------|----------------|
| Upper* | 13,750 | 73,333 |
| Lower | 6,453 | 34,416 |
| Total | 20,203 | 107,749 |

Point Source Inventory

(VA Department of Environmental Quality)

| Watershed | Permit Type | Count (Active or Application) |
|----------------|--------------------|-------------------------------------|
| Accotink Creek | Individual Permits | 5 |
| | General Permits | 23 |
| | MS4 | 6 |
| | Total | 34 |
| Difficult Run | Individual Permits | 3 |
| | General Permits | 9 |
| | MS4 | 5 |
| | Total | 17 |

Next Steps

- **Collect additional available data**
- **Analyze data to investigate the bacteria impairments in the watersheds**
- **Develop:**
 - bacteria source loading estimates
 - modeling input parameters:
 - **Hydrology and water quality**
- **Prepare Draft TMDL Reports**

The background of the slide is a blue-tinted photograph of a river. On the left bank, there are several bare trees with intricate branch structures. In the distance, a bridge with multiple arches spans the river. The water in the foreground shows gentle ripples.

Benthic TMDL

Difficult Run Benthic Impairment

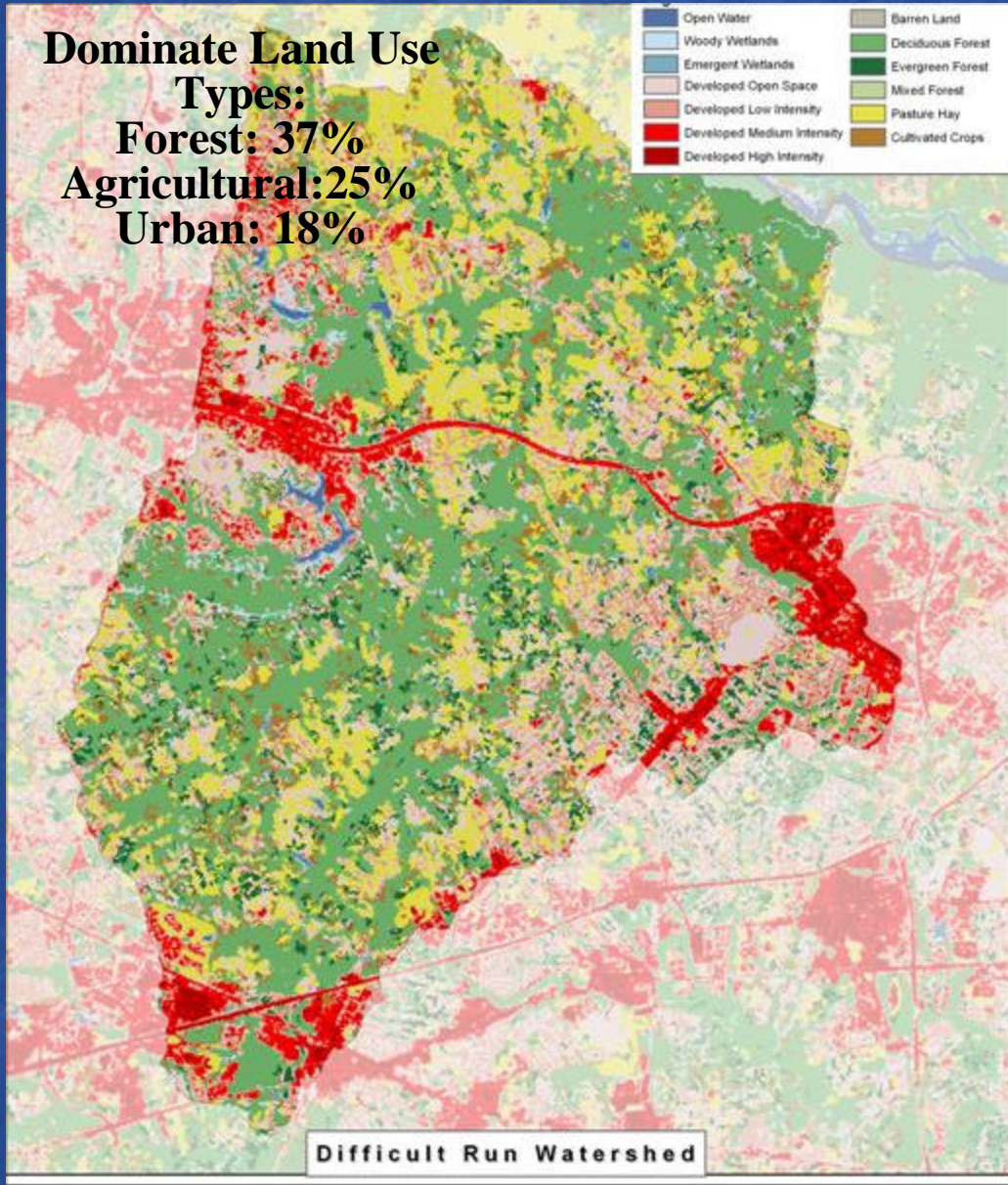
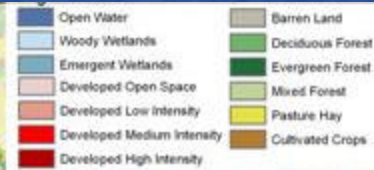
Dominant Land Use

Types:

Forest: 37%

Agricultural: 25%

Urban: 18%



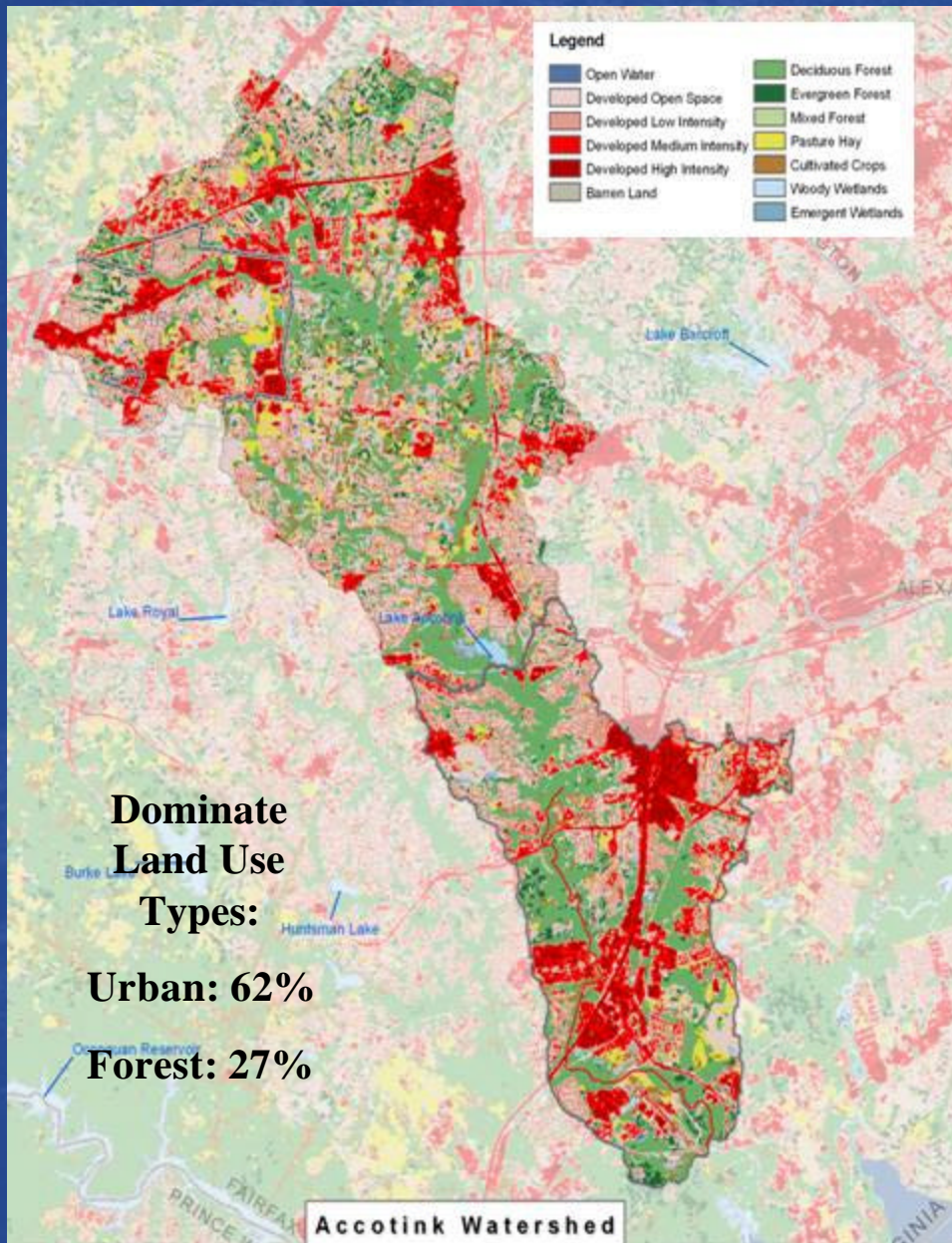
TMDL ID: VAN-A11R-01

Length 2.93 miles

Benthic Impairment begins at the confluence of Captain Hickory Run and extends to the Confluence with the Potomac River.

The segment was first listed in 1994 for moderate benthic impairment.

Accotink Creek Benthic Impairment



TMDL ID: VAN-A15R-01

Length 7.35 miles

Benthic Impairment begins at the confluence of Calamo Branch and extends to the to end of free-flowing waters (Rt. 1).

The segment was first listed in 1996 for moderate benthic impairment.

Biological Monitoring

- **Based on Biological Monitoring**
 - Assessments indicate the benthic community is impaired.
 - Therefore, the listed segments do not meet the Aquatic Life Use support goal.



The General Water Quality Standard: “All state waters shall be free from substances [...] which are harmful to human, animal, plant or aquatic life.” (9 VAC 25-260-20).

TMDL Process for Benthic Impairment

Stressor Identification

- Instream water quality
- Biological Monitoring



Stressor Sources

- Point Sources
- Nonpoint Sources



Stream/River



Loading

Reference Condition



End points



Stressor Load



Response?

Instream
WQ

Benthic
community

Common stressors
include:

- Dissolved Oxygen
- Nutrients
- pH
- Temperature
- Sediment
- Toxics

Benthic Stressor Identification

- **What pollutant(s) is causing the impairment of the benthic community?**
- **Common stressors include:**
 - **Dissolved Oxygen**
 - **Nutrients**
 - **pH**
 - **Temperature**
 - **Sediment**
 - **Toxics**

Data Used in Stressor Identification

Environmental Data:

1. Biological and Habitat Assessment Data

1. Water Quality Data

a) Instream water quality data

2. Toxicity Testing

a) Acute toxicity testing

b) Chronic toxicity testing

3. Discharge Monitoring Reports (DMR)

5. Biologists field notes and observations

Stressor Identification

- **Each candidate stressor will be evaluated based on available monitoring data, field observations, and consideration of potential sources in the watershed**
- **Potential stressors are further classified as a *non-stressor, possible stressor, or most probable stressor.***

Classification of Stressors

- Non-stressors: The stressors with data indicating normal conditions and without water quality standard violations, or without any apparent impact
- Possible stressors: The stressors with data indicating possible links, however, with inconclusive data to show direct impact on the benthic community
- Most probable stressors: The stressors with the conclusive data linking them to the poorer benthic community

Next Steps

- **1st Public Meeting: August 14**
- **Draft Stressor Analysis Report**
- **Modeling Approach Technical Memo**
- **TMDL Allocation Development**
- **Draft TMDL Reports**

Comments? Feedback?

- Public Comment Period for this meeting extends from July 17, 2007 to August 16, 2007.
- All comments should be in writing. Please send them to:

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Local TMDL Contacts



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Reports/presentations available at:

www.deq.virginia.gov/tmdl/mtgppt.html

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